RAILROAD COMMISSION OF TEXAS

HEARINGS DIVISION

OIL AND GAS DOCKET NO. 10-0272890

THE APPLICATION OF FOREST OIL CORPORATION PURSUANT TO 16 TAC §3.9 FOR A PERMIT TO DISPOSE OF OIL AND GAS WASTE BY INJECTION INTO A POROUS FORMATION NOT PRODUCTIVE OF OIL OR GAS FOR THE EPOCH SWD LEASE, WELL NO. 101, LOTT RANCH (MORROW) FIELD, WHEELER COUNTY, TEXAS

HEARD BY: Brian Fancher, P.G. - Technical Examiner
Michael Crnich - Legal Examiner

APPEARANCES:	**REPRESENTING:**
APPLICANT:	
Doug Dashiell	Forest Oil Corporation
Rick Johnston, P.E.	
Kevin Donohue	
John Christofferson	
PROTESTANTS:	
Glenn Johnson	Chesapeake Operating, Inc.
James Bostic	
Phil Moser	
Joe Perez	
Cary McGregor, P.E.	
Rick McCurdy	

PROCEDURAL HISTORY

Application Filed:	June 23, 2011
Protest Received:	July 08, 2011
Request for Hearing:	September 06, 2011
Notice of Hearing:	October 24, 2011
Hearing Held:	December 09, 2011 and January 09-10, 2012
Transcript Received:	January 18, 2012
Closing Statements Received:	February 02, 2012
Proposal for Decision Issued:	October 05, 2012

EXAMINERS' REPORT AND PROPOSAL FOR DECISION
STATEMENT OF THE CASE

Forest Oil Corporation ("Forest") requests disposal authority pursuant to 16 TAC §3.9 for the Epoch SWD Lease, Well No. 101 (API No. 42-483-33303), Lott Ranch (Morrow) Field, Wheeler County, Texas.

Notice of the subject application was published once per week for two consecutive weeks, beginning on May 05, 2011, in *The Wheeler Times*, a newspaper of general circulation in Wheeler County. Notice of the application was sent on October 24, 2011 to the Wheeler County Clerk, offset operators within 1/2 mile and the surface owners of each tract that adjoin the disposal tract

On June 23, 2011, Forest submitted its administrative application to permit the proposed Epoch SWD Lease, Well No. 101 for disposal operation.

By letter dated September 1, 2011, Commission staff informed Forest that greater special conditions are required for wells disposing into the Brown Dolomite formation and therefore requested a letter in response from Forest acknowledging and agreeing to the additional permit requirements.

On September 06, 2011, Forest submitted a letter in response to the above Commission letter, causing the subject application to be administratively complete; however, by letter dated July 08, 2011, the subject application was protested by Chesapeake Operating, Inc., an operator of two horizontal wells completed in the Granite Wash formation and located within the 1/2 mile radius surrounding the subject well.

DISCUSSION OF THE EVIDENCE

Applicant's Evidence

The proposed Epoch SWD Lease, Well No. 101 is located on a 640-acre tract that contains all of Section 1, Block 3, Brooks & Burleson Survey, Wheeler County, Texas. The 640-acre tract was acquired by Epoch Land Ventures, LLC[1] on May 11, 2011 through purchase of a deed to the surface estate (Tr., Vol. I, P. 29, L. 10-13).

As proposed, Forest seeks to drill and complete the subject well to a total depth of 6,000 feet below ground surface. The well will have 10-3/4" surface casing set at 350 feet that will be cemented from the setting depth back to surface with 380 sacks of cement.

---

[1] Epoch Land Ventures, LLC is a wholly owned subsidiary of the applicant, Forest Oil Corporation (Tr., Vol. I, P. 29, L. 5-9).

Beyond that, Forest proposes to run 7" long-string casing to 5,500 feet that will be cemented from 5,500 feet to surface with a total of 775 sacks of cement. The 7" long-string casing will incorporate two multi-stage cementing tools ("DV tools") at 4,631 feet and 1,000 feet. Furthermore, Forest proposes to pump 405 sacks and 280 sacks of cement through each DV tool, respectively. Additionally, Forest proposes the well will be equipped with 3 1/2" tubing and packer set at 4,550 feet.[2]

Forest seeks to dispose of salt water and RCRA exempt oil & gas wastes at the stratigraphic interval situated in the Brown Dolomite formation between 4,631 feet and 5,350 feet. Forest submitted a structural cross-section that includes open-hole well logs from wells surrounding the location of the proposed subject well. Forest testified it identified two target intervals in the Brown Dolomite within its proposed disposal interval. Forest testified it believes these intervals, from 4,620 feet to 4,720 feet and 4,940 feet to 5,100 feet, have higher porosity values than the remaining Brown Dolomite formation. Forest testified these intervals are excellent candidates for disposal of fluids and that there is no hydrocarbon production from the Brown Dolomite formation within five miles of the proposed disposal well (Tr., Vol. I., P. 54, L. 4-7).

In further support of its position, Forest presented a copy of a letter dated September 01, 2011, issued by the Railroad Commission's Underground Injection Control ('UIC") group. In its letter, the UIC indicated that in order to comply with Commission policy regarding disposal wells injecting in the Brown Dolomite formation in Wheeler, Hemphill, and Lipscomb Counties, Texas, the subject well would be required to adhere to additional restrictions implemented in the administrative review.

By letter dated September 06, 2011, Forest agreed to UIC's request and to the additional requirements, which include a maximum surface injection pressure of 1,200 psi, maximum daily injection volume of 10,000 barrels per day ("bpd"), annual H-5 pressure tests, and bottom-hole pressure measurements at the time of each H-5 test (Tr., Vol. I., P. 55, L. 4-17).

The Texas Commission on Environmental Quality's Surface Casing group, now the Railroad Commission's Groundwater Advisory Unit ("GAU"), recommended that usable-quality ground water be protected to ten feet into the Permian red beds or to a depth of 250 feet below the land surface, whichever is deeper. The base of usable standard drinking water ("USDW") is approximately 550 feet. In its evidence, Forest submitted a TCEQ letter dated July 13, 2011, which stated that injection into the proposed disposal interval will not harm usable quality water.

Forest identified two horizontal wellbores completed in the Granite Wash formation that are located within the 1/2-mile radius area of review ("AOR") for the proposed disposal well. Both wells are operated by Chesapeake and are completed in fields that produce from the Granite Wash formation, stratigraphically situated deeper than the Brown Dolomite formation.

---

[2] See Forest Exhibit No. 5 - Proposed wellbore schematic.

Forest operates disposal wells that are separated from the proposed subject well by a range of 7.9 miles to 21.2 miles. Forest testified it operates twenty-three producing wells that utilize these five disposal wells. Forest testified waste hauler trucks transport produced water from its producing wells to the five disposal wells it operates. Forest testified that based upon trucking produced water to these disposal wells, the cost of disposal by trucking is approximately $3.68 per barrel (Tr., Vol. I, P. 62, L. 1-3).

In its application, Forest testified it will not truck produced water from wells it operates to the proposed subject disposal well. Instead, produced water will be piped through a pipeline infrastructure from at least twenty-seven producing wells in the area[3] to the proposed disposal well location. Forest testified that through piping produced water, it estimates the disposal of produced water from the Camp area wells to cost approximately $0.75 per barrel. Forest testified the $0.75 per barrel estimate[4] is based on the disposal fee from one of the five disposal wells it currently operates in the area (Tr., Vol. I, P. 57, L. 2-4 & P. 63, L. 21-24).

In support of its application, Forest submitted evidence that indicates an estimated reduction in operating expenses for the Camp area wells, as a consequence of the subject application's approval. Utilizing data taken from its surrounding disposal operations, Forest testified that it will be able to reduce operating expenses by $15,000 per day, or $5.4 million per year for its Camp area wells, if the subject application is approved (Tr., Vol. I., P. 68, L. 13-22).

At the hearing, Forest submitted a tabulation of disposal wells that have received a permit to dispose of fluids in Wheeler County, Texas. Fifty-six wells have been granted a permit to dispose of fluids in Wheeler County, Texas. Thirty-seven of these wells area authorized to dispose solely in the Brown Dolomite formation. Beyond that, an additional five wells have been granted disposal authority for disposal intervals that include the Brown Dolomite formation and stratigraphic formations above and below the Brown Dolomite (Tr., Vol. I., P. 69, L. 5-10 & P. 70, L. 2-8). Furthermore, Forest testified that 21.6 million barrels of fluids were disposed in the Brown Dolomite formation and 1.3 million barrels of fluids in the Brown Dolomite, et. al.[5] formations in the past three years.

Forest submitted evidence that included proposals for decisions and final orders for Oil & Gas Docket Nos. 10-0251513 and 10-0251514, the applications of Newfield Exploration for disposal

---

[3] The Camp area wells are hydrocarbon producing wells and proposed wells that surround the proposed location for the Epoch SWD Lease, Well No. 101.

[4] The estimate is based on the $90.0 disposal fee divided by 120 barrels of fluid produced from one of the Camp area wells. The average liquid volume per waste hauler load is approximately 120 barrels of fluid.

[5] The Brown Dolomite, et. al. formations include the Brown Dolomite, Pennsylvanian-Shale/Lime, Council Grove, Panhandle-Lime, and Lower Wolfcamp formations.

operations in the Thomas Britt Lease, Well No. 106 and the Britt Ranch "E" Lease, Well No. 308, respectively. Forest testified that the two Newfield applications were similar to the subject application with the principal dissimilarity being the Newfield wells were placed in an area more densely developed with producing wells (Tr., Vol. I. P. 73, L. 6-13). The Newfield wells are separated from the subject well by approximately nine and twelve miles.[6] Ultimately, these Newfield wells were granted disposal authority by Commission Final Order.

Lastly, Forest submitted copies of two disposal well permits for wells operated by Chesapeake that are located approximately five miles and fourteen miles east of the subject well's location. Chesapeake's Reed SWD Lease, Well No. 1 (API No. 42-483-31962) and Atherton Lease, Well No. 1D (API No. 42-483-31703) are active disposal wells that utilize the Brown Dolomite formation for fluid injection at permitted rates of 10,000 and 20,000 barrels of fluid per day, respectively.

Forest has an active Form P-5 (Organization Report) and has posted $350,000 financial assurance in the form of a bond through RLI Insurance Company.

Protestants' Evidence

At the hearing, Chesapeake Operating, Inc. ("Chesapeake") protested the subject application and asserted that Forest's request for the proposed disposal well permit should be denied. In summary, Chesapeake asserted that approval of the Epoch SWD Lease, Well No. 101 would cause corrosion to the steel-casing in four of its unprotected wells[7] located within one and one-half of a mile from the location of the subject well. Chesapeake claimed that casing corrosion could render the wells inoperable, and thereby potentially affect the remaining reserves in the Granite Wash and Morrow formations encountered in the four wells.

Geologic Setting

Chesapeake submitted evidence that depicts the generalized stratigraphy of the area surrounding the proposed subject well, including the Brown Dolomite and formations stratigraphically situated beneath the Brown Dolomite formation. Chesapeake testified that in Wheeler County, the Brown Dolomite formation is overlain by the Panhandle Limestone, comprised predominately of anhydrite, and underlain by the Council Grove formation. Chesapeake testified the Brown Dolomite is an excellent candidate for disposal of fluids and that it is a confined formation throughout the area (Tr., Vol. II, P. 14, L. 6-10).

---

[6] See Forest Exhibit No. 19

[7] An unprotected well is a well completed with steel casing that does not have cement circulated above the top of the Brown Dolomite formation.

Further, Chesapeake focused on specific stratigraphic horizons below the Council Grove formation that include the Cottage Grove, Hogshooter, Granite Wash, and Morrow formations. Chesapeake testified the predominate hydrocarbon producing formation in the area surrounding the subject well is the Granite Wash formation.

Potential Behind-Pipe Reserves

In support of its position, Chesapeake submitted three composite well logs[8] taken from two vertical wells near the proposed subject disposal well. The composite well logs were taken from two Chesapeake operated wells:

Well Name	API Number	Distance & Location[9]
Lott 2-2	42-483-31875	1 mile, East
Thurman Horn 1	42-483-30488	1.5 miles, Northwest

Chesapeake testified it performed a study on the behind pipe reserves that exist in wells operated by Chesapeake near the subject disposal well. In short, Chesapeake studied wells that were uncemented across the Brown Dolomite formation, in an effort to understand what potential hydrocarbon reserves may be at risk if the subject well is granted approval and causes corrosion in the uncemented wells.

Based upon its petrophysical evaluations, Chesapeake testified the Lott 2-2 well encounters potential productive intervals in the basal Cottage Grove and upper Hogshooter formations, stratigraphically situated below the base of the Brown Dolomite formation, at approximately 10,118 feet and 10,175 feet below ground surface[10]. Chesapeake testified the mud log for the Lott 2-2 indicates an increase of hydrocarbon gas as the well was drilled into these formations, indicating hydrocarbon reserves that could be lost if the Lott 2-2 were potentially compromised (Tr., Vol. I, P. 213, L. 1-2).

Next, Chesapeake testified the first composite log for the Thurman Horn 1 well indicates the basal Cottage Grove and upper Hogshooter formations encounter hydrocarbons as well. Chesapeake asserted an operator would be inept if these zones were not tested prior to abandoning the well (Tr., Vol. I, P. 215, L. 7-22 & P. 216, L. 10-15).

---

[8] Composite well logs incorporate petrophysical data taken from individual porosity, mud log, and resistivity logs, measured from the same well-bore, into one well-log.

[9] The location and distance provided is in reference to the subject disposal well.

[10] See Chesapeake Exhibit No. 9

The second composite log for the Thurman Horn 1 well, also the third overall composite log submitted for the two Chesapeake wells, was performed with emphasis on the Morrow formation.[11] Chesapeake testified that this composite log indicates good drilling breaks associated with the section of rock formation exhibiting a porosity value of eight percent or greater. In summation, Chesapeake testified its petrophysical analyses of this composite log indicates behind-pipe potential (Tr., Vol. I. P. 219, L. 5-8). No hydrocarbon potential reserve estimates were submitted on behalf of Chesapeake to support its claims of potential production values in the Cottage Grove, Hogshooter, or Morrow formations.

Casing Corrosion

In summary, Chesapeake testified that generally two types of corrosion occur upon wells completed with steel casing in hydrocarbon reservoirs: (1) generalized attack and (2) pitting attack (Tr. Vol. II, P. 41, L. 11-14). In a generalized attack, Chesapeake testified a corrosive process affects an entire metal surface at the same time, while a pitting attack is more localized and therefore causes more catastrophic failures. Furthermore, Chesapeake testified that casing, protected with cement, does not corrode (Tr., Vol. II, P. 46, P. 1-2).

Chesapeake testified that there are four vertical wells it operates surrounding the proposed subject well that lack cement behind casing across the Brown Dolomite formation (Tr. Vol. III, P. 20, L. 16-19). Specifically, the four wells are:[12]

Well Name	API No.	Formation	Producing Interval
Lott 2-2	42-483-31875	Granite Wash	11,504 - 12,348
T.A. Greenhouse 1	42-483-30514	Up. Morrow	14,538 - 14,786
Atherton 1	42-483-30557	Up. Morrow	14,621 - 14,639
Horn 1	42-483-30488	Up. Morrow	14,850 - 14,850

Chesapeake asserted that if the subject disposal application were granted at its proposed location and the disposal well caused corrosion that made Chesapeake's wells inoperable, Chesapeake could potentially lose approximately 1.5 BCF of hydrocarbon gas and 26,000 barrels of condensate from the above four wells[13].

---

[11]The Morrow formation is stratigraphically situated below the lithologic units comprising the Granite Wash formation (Tr. Vol I, P. 217, L. 25).

[12] See Chesapeake Exhibit Nos. 46 & 47.

[13] See Chesapeake Exhibit No. 54

Additionally, Chesapeake identified ten other wells that surround the proposed subject well location that are operated by Forest. Chesapeake testified these ten wells do not have cement across the Brown Dolomite formation and are completed in fields producing from the Granite Wash formation. Chesapeake claimed the potential loss of hydrocarbons from wells operated by Forest, as a consequence of the subject well, is estimated at 178 MMCF and 5,206 barrels of condensate (Tr. Vol. III, P. 53, L. 21-23).

Overall, Chesapeake contends the subject application should be denied for two reasons: (1) there is not a need for the proposed disposal well and (2) the actions of Forest will adversely affect the reserves available in the four vertical Chesapeake wells nearby the subject well (Tr. Vol. I, P. 22, L. 8-21 & P. 23, L. 5-10).

EXAMINERS' OPINION AND DISCUSSION

Based upon the physical evidence and testimony submitted on behalf of the two parties, the examiners recommend that the application for disposal authority be granted, as ultimately proposed by Forest. The examiners conclude that Forest has met its burden of proof, as required in 16 Texas Administrative Code §3.9 and Texas Water Code § 27.051, and that the following was established:

1. Surface and groundwater will be adequately protected from endangerment;

2. The proposed injection well will not endanger or injure any oil, gas, or mineral formations;

3. The proposed injection is in the public interest; and

4. The applicant has made a satisfactory showing of financial responsibility, as required under Commission statutes and Commission regulatory requirements.

The Epoch SWD Lease, Well No. 101 will be completed in a manner which will protect usable-quality water resources and confine disposal fluids to the permitted injection interval. There are two horizontal producing wells located within the 1/2-mile AOR of the subject well. Both wells are operated by Chesapeake and produce from the Granite Wash formation. The wells are properly cased and cemented and will not provide a conduit for the migration of injected fluids from the injection interval into other oil, gas or mineral bearing formations or useable-quality groundwater zones.

The examiners believe that Chesapeake did not prove that injection or disposal into the Brown Dolomite formation at the location of the proposed subject well will cause corrosion in its unprotected wells located over a mile away. Chesapeake testified that the fluids in the Brown

Dolomite formation are corrosive to unprotected wells in the area, yet Chesapeake continues to operate multiple disposal wells in the area that are just as likely to adversely affect their own wells.[14]

Approval of the application is in the public interest. In fact, Chesapeake testified there is a great need for disposal in Hemphill, Wheeler, and Ochiltree Counties and that it recognizes this need (Tr., Vol. III, P. 15, L. 2-7). Granite Wash formation development, along with Morrow formation development, encompasses the area surrounding the proposed location for the subject well in Wheeler County. Forest testified there will be twenty-seven wells it operates that will utilize the disposal capacity of the subject well. Forest testified that fluids will be piped to the proposed disposal well, rather than by waste hauler trucks. Therefore, the examiners feel that use of the proposed disposal well will reduce truck traffic, travel time and miles traveled, resulting in reduced disposal costs to Forest. The reduced disposal costs will lower the economic limit of the producing wells and, thereby, ultimately increase total hydrocarbon recovery.

FINDINGS OF FACT

1. Notice of the application and hearing was provided to all persons entitled to notice. Notice of the application was sent to the Wheeler County Clerk, offset operators within 1/2-mile and the surface owners of each tract which adjoins the disposal tract on October 24, 2011.

2. Notice of the subject application was published in *The Wheeler Times*, a newspaper of general circulation in Wheeler County.

3. The proposed injection into the Epoch SWD Lease, Well No. 101 (API No. 42-483-33303), will not endanger useable quality water.

    a. The Texas Commission on Environmental Quality ("TCEQ") recommends that usable-quality ground water be protected to a depth of 250 feet below the surface.

    b. The well will have 10 3/4" surface casing set at 350 feet that will be cemented to the surface with 380 sacks of cement.

    c. The Brown Dolomite formation is an excellent candidate for disposal in Wheeler County, Texas and is naturally capped by anhydrite.

---

[14] See Oil & Gas Final Orders 10-0251513 & 10-0251514: *The Applications of Newfield Exploration Midcontinent, Inc. For Authority Pursuant to* 16 TAC §3.9 *For its Thomas Britt Lease, Well No. 106 & Britt Ranch "E" Lease, Well No. 308, Wheeler County, Texas.*

4. The proposed injection into the Epoch SWD Lease, Well No. 101, will not endanger production from other oil, gas or mineral-bearing formations.

   a. Forest Oil Corporation ("Forest") plans to drill a new injection well down to 6,000 feet.

   b. Forest proposes to run 7" long-string casing from surface to 5,500 feet that will be cemented to surface with 775 sacks of cement.

   c. The well will be equipped with 3-1/2" tubing and packer set at 4,550 feet.

   d. There are only two Granite Wash formation producing wells located within the 1/2-mile radius of review for the proposed disposal well. The wells are properly cased and cemented and will not provide a conduit for the migration of injected fluids from the injection interval into other oil, gas or mineral bearing formations or useable-quality groundwater zones.

   e. Use of the Epoch SWD Lease, Well No. 101 will reduce Forest's operating expenses for the Camp area wells by $5.4 million per year.

5. Use of the Epoch SWD Lease, Well No. 101 , as a disposal well is in the public interest because it will reduce operating expenses and will provide needed commercial disposal capacity for wells to be drilled, completed and produced in the area of the proposed facility.

   a. The Granite Wash formation development and Morrow formation development encompass northeastern Wheeler County, Texas.

   b. The Epoch SWD Lease, Well No. 101 is necessary to provide needed capacity for disposal of frac and produced water from numerous Granite Wash formation wells to be drilled and produced within northeastern Wheeler County.

   c. The Epoch SWD Lease, Well No. 101 will be connected to a series of disposal fluid pipelines from nearby producing wells that will dispose of produced water.

   f. Use of the proposed disposal well will reduce truck traffic, travel time and miles traveled, resulting in reduced disposal costs to operators.

   g. The reduced disposal costs will lower the economic limit of the producing wells and, thereby, ultimately increase total production.

6. Forest has a current approved Form P-5 (Organization Report) and a $350,000 financial assurance bond.

CONCLUSIONS OF LAW

1. Proper notice was issued in accordance with the applicable statutory and regulatory requirements.

2. All things necessary to give the Railroad Commission jurisdiction to consider this matter have occurred.

3. Approval of the application will not harm useable quality water resources, will not endanger oil, gas, or geothermal resources, will promote further development in this area of Wheeler County and is in the public interest pursuant to §27.051 of the Texas Water Code.

4. Forest Oil Corporation has met its burden of proof and its application satisfies the requirements of Chapter 27 of the Texas Water Code and 16 Texas Administrative Code §3.9.

EXAMINERS' RECOMMENDATION

Based on the above findings of fact and conclusions of law, the examiners recommend that the Commission approve the application of Forest Oil Corporation for disposal authority pursuant to 16 TAC §3.9 for the Epoch SWD Lease, Well No. 101 (API No. 42-483-33303), as set out in the attached Final Order.

Respectfully submitted,

Brian Fancher, P.G.
Technical Examiner

Michael Crnich
Legal Examiner